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(54) PIGMENT FOR FILTER AND PATTERN FORMATION USING THE SAME, AND COLOR CATHODE RAY TUBE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a method for pattern formation capable of affording in high accuracy, well-balanced filter patterns and fluophor patterns, and capable of improving the yielding percentage and/or lowering the cost.

SOLUTION: This method for pattern formation comprises the steps of forming a film of a fluophor composition on a film of a resin composition for filters, exposing the film side of the resin composition to light using an exposure mask followed by carrying out a development operation, and thereby simultaneously forming a filter pattern and a fluophor pattern. The resin composition for filters is such one as to be produced by dispersing a pigment for filters in a sensitizing solution (PVA + aqueous ammonium dichromate solution), and the pigment for filters is

such one as to have a reflectance for the wavelength in the ultraviolet rays of ≥50%.

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CLAIMS

[Claim(s)]

[Claim 1] The pigment for filters whose reflection factor in the wavelength of the above-mentioned ultraviolet rays it is the pigment distributed by the sensitization liquid containing the induction component which induces a resinous principle and ultraviolet rays and starts the polymerization of the above-mentioned resinous principle, and is 50% or more.

[Claim 2] The pigment for filters according to claim 1 characterized by the wavelength of ultraviolet rays being 365nm.

[Claim 3] The pigment for filters according to claim 1 or 2 characterized by mean particle diameter being 1 micrometer or less.

[Claim 4] The pattern formation approach which carries out ultraviolet-rays exposure, develops the film of the resin constituent for filters which comes to distribute the pigment for filters according to claim 1 to 3 using an exposure mask in the sensitization liquid containing the induction component which

induces a resinous principle and ultraviolet rays and starts the polymerization of the above-mentioned resinous principle, and forms a filter pattern.

[Claim 5] The pattern formation approach according to claim 4 which forms in the film of the resin constituent for filters the film of the fluorescent substance constituent which comes to distribute a fluorescent substance in sensitization liquid, exposes and develops ultraviolet rays on it using an exposure mask from the film side of the resin constituent for filters, and forms a filter pattern and a fluorescent substance pattern in coincidence.

[Claim 6] The color cathode-ray tube which comes to prepare a fluorescent substance pattern in a face shield inside by the pattern formation approach according to claim 4 or 5 through a filter pattern.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the color cathode-ray tube which used this for the pattern formation approach list using the pigment for filters and this which are used for for example, a television television machine or the color

cathode-ray tube of a display application.

[0002]

[Description of the Prior Art] The display engine performance of a color cathode-ray tube was shown by elements, such as brightness, resolution, and contrast, and various amelioration for these improvement in a property has been added. Specifically, various amelioration of a fluorescent substance, adoption of the black matrix for the improvement in contrast, etc. are mentioned as an example for the improvement in a brightness property.

[0003] Now, in order to raise the contrast which is one of the display engine performance of these, it is effective to stop the light which outdoor daylight, such as outdoor daylight reflection of a color cathode-ray tube, i.e., sunlight, and a tonneau light, reflects and produces with the face plate of a cathode-ray tube. In addition to the light in the outside surface of a face shield to reflect, some which it is reflected in a fluorescent substance layer and penetrated again have the light which penetrated the face shield in outdoor daylight reflection.

[0004] In order to suppress reflection by the face shield outside surface mentioned above, in the Provisional-Publication-No. No. 71801 [63 to] official report, forming the antireflection film with which a refractive index decreases continuously from a face glass side is proposed. Moreover, in the publication-number No. 154444 [one to] official report, the two-layer

antireflection film which carried out the laminating of a high refractive-index ingredient and the low refractive-index ingredient is proposed. However, although reflection by the face shield outside surface can be lessened by such approach, there is no effectiveness of suppressing reflection of the light which penetrated the face shield mentioned later.

[0005] Then, there are two methods of lowering the permeability of a face shield or making the reflection factor of a fluorescent substance layer low as an approach of weakening the light which penetrates a face shield and is reflected in a phosphor screen. the glass with which the 1st approach is actually widely applied to the product which lowered the transmission of a face shield, and the tint or average transmission coefficient whose average transmission coefficient is about 55% now is called 50% or less of dark tint -- the ground is used.

[0006] Now, as an approach of lowering the reflection factor of the 2nd fluorescent substance layer, the fluorescent substance with a pigment is widely used as indicated by the publication {the volume fluorescent substance handbook P.257 and on fluorescent substance said society, Ohm-Sha, Ltd., and 1987}. This makes the inorganic pigment of a particle which has a selective-absorption property in fields other than the luminescence wavelength of each color adhere to the powder particle front face of blue and a red fluorescent substance. By using this fluorescent substance with a pigment, the

light of wavelength other than luminescence of each color can be absorbed, and reflection of outdoor daylight can be suppressed. In addition, the pigment is not used, in order for a fine-particles reflected color to be yellowish green and, as for a green fluorescent substance, for the fluorescent substance itself to absorb light other than luminescence wavelength to some extent.

[0007] Drawing 2 is the explanatory view showing the configuration of the phosphor screen of the above-mentioned conventional color cathode-ray tube. In drawing, the red and green in which a face shield and 2 were formed in the black matrix, and 3r, 3g, and 3b were formed for 1 a stripe or in the shape of a dot, respectively and a blue fluorescent substance layer, and 5 are the metal backs. Thus, in what was constituted, brightness and contrast are determined as mentioned above combining the glass 1 (a dark tint or tint) of low transmission, and the fluorescent substance layers 3r, 3g, and 3b with a pigment.

[0008] However, the pigment which acts effective in absorption of outdoor daylight in the fluorescent substance layer using a fluorescent substance with a pigment is in the location near a face shield 1 side, and the pigment which exists in the other part, for example, the pigment adhering to the fluorescent substance particle of the location distant distantly [face shield / 1 / the metal back 5 side of a fluorescent substance or], is not contributed to absorption of outdoor daylight. Moreover, a pigment is not completely transparent to luminescence of a

fluorescent substance, and it cannot avoid that luminescence will be absorbed to some extent. Therefore, the pigment which is not contributed to reduction of outdoor daylight reflection has the problem of causing a brightness fall.

[0009] In recent years, as an approach of solving these problems, a color filter is formed by the ultrafine particle inorganic pigment between a fluorescent substance layer and a face shield at a publication-number No. 7457 [one to] official report, a publication-number No. 275006 [five to] official report, etc., and the technique of raising brightness is reported, without reducing contrast by combining with the glass of high permeability. Drawing 3 is the explanatory view showing the configuration of the phosphor screen of the above-mentioned conventional color cathode-ray tube with a RGB filter. In drawing, 4r, 4g, and 4b are red, green, and a blue pigment filter layer, respectively. Each fluorescent substance layers 3r, 3g, and 3b and each pigment filter layers 4r, 4g, and 4b are formed a stripe or in the shape of a dot, respectively. The light which emitted light in each color fluorescent substance layers 3r, 3g, and 3b penetrates each filter layer 4r, 4g, and 4b, and forms a display image. The permeability of each filter layer 4r, 4g, and 4b is high in the wavelength field corresponding to each luminescent color, and it is set up so that it may become low in the other wavelength field.

[0010] Thus, in the formed phosphor screen, the outdoor daylight which

penetrates and carries out incidence of the face shield 1 is mainly absorbed in the filter layers 4r, 4g, and 4b. On the other hand, although luminescence from the fluorescent substance layers 3r, 3g, and 3b penetrates the filter layers 4r, 4g, and 4b, there is little attenuation at that time. Thus, since outdoor daylight is absorbed in the filter layers 4r, 4g, and 4b, the face shield 1 which has high permeability can be used from what is shown in above-mentioned drawing 2 .

[0011] The above-mentioned filter layers 4r, 4g, and 4b can be formed by carrying out patterning of the filter layer with the suitable transparency property for luminescence of each fluorescent substance between each fluorescent substance layer and a face shield, respectively. That is, form a red filter in the part in which a red fluorescent substance is located, and a blue filter is formed in a green fluorescent substance at the parts of a green filter and a blue fluorescent substance, or there is the approach (publication-number No. 240156 [seven to] official report) of forming the filter which has a suitable transparency property in common with each fluorescent substance all over a wavelength field face shield. Furthermore, what forms a filter pattern on the pattern with which the pattern of a filter is formed in a certain specific fluorescent substance pattern, for example, a red fluorescent substance and a blue fluorescent substance are located in it among tri color phosphor patterns, the thing which carries out patterning of the filter only on a blue fluorescent substance pattern are various. However, in any

case, a stable inorganic pigment is used to the electron ray impact inside a cathode-ray tube, a high vacuum environment, and the heating process at the time of cathode-ray tube production.

[0012] as the pigment used for a filter layer -- each color fluorescent substance -- corresponding -- for example, red -- Fe 2O3 -- blue -- CoO-aluminum 2O3 -- pigments, such as TiO2 and CoO-NiO-ZnO, or CoO-CrO2, TiO2, aluminum, etc. 2O3, are proposed in the publication {SID 95 DIGEST, P.25-27 (1995)} green. Moreover, in the Provisional-Publication-No. No. 48385 [63 to] official report, what formed the filter layer with light opening cobalt violet or a manganese violet pigment corresponding to red and a blue fluorescent substance layer is indicated as a pigment used for the filter layer which has a suitable transparency property in common with each above-mentioned color fluorescent substance.

[0013] In order to prepare the filter pattern corresponding to a fluorescent substance pattern using each above-mentioned color pigment, respectively Spreading / desiccation process of the resin constituent for filters (pigment slurry) which distributed the pigment in sensitization liquid (for example, water solution with the ammonium dichromate which induces PVA and a mercury i line and starts the polymerization of PVA) after forming a black matrix, It is necessary to add the development process which removes the pigment slurry adhering to exposure by the mercury i line (365nm) which furthermore used the shadow

mask as the exposure mask, and an excessive part. This process is fundamentally [as the formation process of the fluorescent substance pattern which is a process after that] the same, and in most, a total of 6 times of exposure / development processes are needed for fluorescent substance pattern formation and filter pattern formation.

[0014]

[Problem(s) to be Solved by the Invention] However, in the process of the above-mentioned filter pattern formation, the formation precision of a filter pattern is bad, and in being severe, the problem that pattern formation is impossible has arisen. From now on, highly minute-ization of a cathode-ray tube is called for further, and the badness of the formation precision of this filter pattern will become a fatal failure in the present condition that it is becoming indispensable to form pattern width of face thinly.

[0015] Usually, although the improvement of the patterning nature of a fluorescent substance pattern is made by controlling exposure conditions, a fluorescent substance slurry presentation, etc., in the case of filter pattern formation, the improvement by optimization of these process conditions is seldom expectable. that is, the cause of the above-mentioned problem originates in the various above-mentioned process conditions -- **** -- essential -- an inorganic pigment -- i line of mercury -- receiving -- a high absorption

coefficient -- **** -- it is because it originates in it being. that is, since a pigment for filters which be mentioned as the above-mentioned example , for example , 2OCoO-aluminum3 pigment , have a high absorption coefficient to i line of the mercury use for patterning exposure , i line of the mercury irradiated for exposure will be absorb by the pigment for filters , and it cannot participate in the polymerization of an important resinous principle , a polymerization reaction will not fully progress , but the filter with a bad formation precision of a pattern will form a filter pattern .

[0016] Furthermore, it is necessary for forming a filter and a fluorescent substance pattern to repeat many exposure / development processes further as mentioned above, and there is also a problem that a manufacturing cost rises sharply by plant-and-equipment investment and yield fall.

[0017] pattern formation approach **** which it can be make in order that this invention may solve this technical problem, and obtain the pigment for filters with little absorption of the ultraviolet rays which the induction component in sensitization liquid induce, and a healthy filter pattern can be obtain, and the formation of a filter pattern and a fluorescent substance pattern whose precision improved can carry out to coincidence, and can contribute also to the improvement in the yield, or low cost-ization -- it aim at obtain the color cathode-ray tube which be excellent in a display engine performance at things

and a list.

[0018]

[Means for Solving the Problem] The 1st pigment for filters concerning this invention is a pigment distributed by the sensitization liquid containing the induction component which induces a resinous principle and ultraviolet rays and starts the polymerization of the above-mentioned resinous principle, and the reflection factor in the wavelength of the above-mentioned ultraviolet rays is 50% or more of thing.

[0019] In the pigment for filters of the above 1st, the wavelength of ultraviolet rays of the 2nd pigment for filters concerning this invention is 365nm.

[0020] The above 1st or the 2nd pigment for filters is [the mean particle diameter of the 3rd pigment for filters concerning this invention] a thing 1 micrometer or less.

[0021] The 1st pattern formation approach concerning this invention is the approach of carrying out ultraviolet-rays exposure, developing the film of the resin constituent for filters which comes to distribute the above 1st thru/or the 3rd one of the pigments for filters using an exposure mask, in the sensitization liquid containing the induction component which induces a resinous principle and ultraviolet rays and starts the polymerization of the above-mentioned resinous principle, and forming a filter pattern.

[0022] The 2nd pattern formation approach concerning this invention is the approach of forming in the film of the resin constituent for filters the film of the fluorescent substance constituent which comes to distribute a fluorescent substance in sensitization liquid, exposing and developing ultraviolet rays on it using an exposure mask from the film side of the resin constituent for filters, and forming a filter pattern and a fluorescent substance pattern in coincidence in the pattern formation approach of the above 1st.

[0023] The 1st color cathode-ray tube concerning this invention comes to prepare a fluorescent substance pattern in a face shield inside by the above 1st or the 2nd pattern formation approach through a filter pattern.

[0024]

[Embodiment of the Invention] The pigment for filters of the gestalt of operation of the 1st of this invention is distributed and used for the sensitization liquid containing the induction component which induces a resinous principle and ultraviolet rays and starts the polymerization of the above-mentioned resinous principle, and the reflection factor in the wavelength of the above-mentioned ultraviolet rays is 50% or more of thing. As the above-mentioned sensitization liquid, it is the water solution which contains polyvinyl alcohol and sensitization agents, such as an ammonium dichromate, a potassium dichromate, or a sodium dichromate, for example, and a sensitization agent starts the

polymerization of polyvinyl alcohol by ultraviolet rays.

[0025] The relation between the amount (amount of ultraviolet radiation reflected by the pigment) of the ultraviolet radiation absorbed by the pigment at the time of ultraviolet-rays exposure and the soundness of the pattern which formed the above-mentioned pigment using the resin constituent for filters which the above-mentioned sensitization liquid was made to distribute was investigated. That is, when the pigment had the reflection factor to 365nm ultraviolet radiation of how much, it examined whether a healthy pattern would be obtained.

[0026] Using the common ultrafine particle ulmin acid cobalt {the product made from Oriental Pigment} as a pigment for filters as a pigment, in order to adjust the reflection factor of the above-mentioned pigment, the titanium dioxide {the Ishihara Sangyo Kaisha, Ltd. make} and the above-mentioned ulmin acid cobalt which have a high reflection factor by 365nm were mixed by various weight ratios, and this was ink-ized, and it distributed in the above-mentioned sensitization liquid, and considered as the resin constituent for filters. Next, the film of the resin constituent for filters of 0.5-micrometer thickness was formed with the spin coat method, 365nm light was exposed and developed and the pattern was formed. Then, by viewing, the formation precision of a pattern was investigated and pattern soundness was judged. A result is shown in the following table 1.

[0027]

[Table 1]

アルミン酸コバルト（ｗｔ％）	酸化チタン（ｗｔ％）	反射率（３６５ｎｍ）（％）	健全性
１００	０	４５	×
９０	１０	４９	△
８０	２０	５６	○
７０	３０	６３	○

[0028] As shown in Table 1, in order to obtain a healthy filter pattern, it turns out that it has the absorption property (reflection property) which does not bar the polymerization of the resinous principle of the resin constituent for filters as the one where the reflection factor of a pigment is higher is good and is especially 50% or more.

[0029] That is, although there were many inorganic pigments reported to be suitable for a filter until now, each is reported in consideration of the transparency spectrum in the light region based on the improvement in the display engine performance (brightness, resolution, contrast), and the adjustment with actual patterning conditions was not necessarily able to be taken.

[0030] That is, although the fine-particles reflected color of the pigment generally used as an object for filters is in agreement with the luminescent color which you are going to make it penetrate in many cases, not both are necessarily in

agreement. It is because the transparency spectrum of the filter is not necessarily in agreement although it is similar with the own reflectance spectrum of a pigment when the same pigment is used for this as a filter to the fine-particles reflected color of a pigment being prescribed by the reflectance spectrum to a full-visible wavelength beam of light.

[0031] For example, although high permeability is shown that CoO-aluminum 2O3 known as the above-mentioned blue pigment is expected from a fine-particles reflected color when it is made into a filter in the wavelength field of blue fluorescent substance luminescence, permeability quite high also in the wavelength field of red fluorescent substance luminescence is shown. That is, even if it installs this filter in the location of a red fluorescent substance pattern, it not only installs it in the same location of a blue fluorescent substance pattern, but it can acquire the screen effect.

[0032] Then, when artificers considered the relation of the absorption property and patterning nature in the ultraviolet area of a pigment as mentioned above, for example, patterning was performed using a 365nm mercury i line, the reflection factor of a 365nm inorganic pigment found out that a healthy filter pattern could be obtained with it being 50% or more.

[0033] Furthermore, it is the following general formula (1) as an inorganic pigment which satisfies the absorption property in the above-mentioned

ultraviolet area, and fills filter shape sufficient also in a light field.

(M1-xNx) PyO3y+1 .. (1)

(-- it found out that the pigment in which M is shown by at least one sort of Co, nickel, Fe, and Mn among a formula, and N is shown by at least one sort of Li, Na, K, Rb, and Cs, 0<=x<1, and 1 <=y) was effective. Since it is the pigment in which the inorganic pigment of this invention has a phosphoric-acid radical to many of usual pigments for filters of the above-mentioned pigment being oxide pigments, absorption in an ultraviolet radiation field shows a high reflection factor in an ultraviolet radiation field few that is, compared with other oxide pigments, the photosensitivity in the case of filter patterning does not fall, and a good pattern is obtained. Although the reason a pigment with a phosphoric-acid radical has a high reflection factor in an ultraviolet radiation field was not clear, artificers found out that the same effectiveness was acquired in many pigments with a phosphoric-acid radical. Of course, the pigment with the above-mentioned phosphoric-acid radical has a deep color, in the light field, it has sufficient absorptive power, the filter shape in the light field which influences a display property greatly also comes out enough, and a certain thing cannot be overemphasized.

[0034] In addition, since transparency is required for the filter pattern described so far, it is important for the particle size of the above-mentioned pigment

particle that it is 1 micrometer or less. Moreover, it cannot be overemphasized that it sets up so that the permeability of each filter layer may be high and may become low in the other wavelength field on the wavelength corresponding to each luminescent color.

[0035] It is the approach of the pattern formation approach of the gestalt operation of the 2nd of this invention forming the film of the resin constituent for filters which distributed the pigment for filters of the gestalt of the 1st operation in the above-mentioned sensitization liquid, and exposing and developing ultraviolet rays using an exposure mask, and forming a filter pattern, and since the ultraviolet absorption of the pigment for filters decreases, a healthy filter pattern is obtained with high precision.

[0036] Moreover, by forming in the film of the above-mentioned resin constituent for filters the film of the fluorescent substance constituent which distributed the fluorescent substance at the above-mentioned sensitization liquid, and exposing and developing negatives from the film side of the resin constituent for filters using an exposure mask Since the ultraviolet rays irradiated become easy to pass the film of the resin constituent for filters While being able to expose and develop a filter and a fluorescent substance at coincidence, being able to form a filter pattern and a fluorescent substance pattern in coincidence, and a process's decreasing and being able to realize improvement in the yield, and low

cost-ization It is effective in the ability to obtain a healthy filter pattern and a fluorescent substance pattern with high precision.

[0037] By the pattern formation approach of the gestalt implementation the above 2nd, the color cathode-ray tube of the gestalt of operation of the 3rd of this invention prepares the filter pattern corresponding to the above-mentioned fluorescent substance pattern between the face shield inside after black matrix formation, and a fluorescent substance pattern, and is produced through sealing of after that usual CRT, and an exhaust air process.

[0038]

[Example] Hereafter, an example is shown and invention is explained to a pan detail.

[0039] In the example 1. above-mentioned general formula (1), the example using M=K and KCoPO4 which is a pigment in N=Co is explained. In addition, this pigment is a blue pigment with big absorptive power. Of course, even when other values are used for M and N at other elements, or x and y, the same effectiveness is acquired although coloring changes.

[0040] The resin constituent for filters (pigment slurry) was produced in the following procedures. It mixes with the water solution which uses polycarboxylic acid ammonium as a dispersant for a KCoPO4 pigment particle, and contains 0.1wt(s)% polyvinyl alcohol. It is set up to about 10 wt(s)%, and solid content

concentration uses alumina balls and a mill pot, and a ball mill is performed, and it is ground and distributed. In order to remove a big and rough particle from this solution, it filters using qualitative filter paper.

[0041] When the particle size distribution of KCoPO4 in the pigment slurry produced in the above procedures were measured with the centrifugal type particle-size-distribution measuring device, mean particle diameter was 0.9 micrometers. The ammonium-dichromate water solution was further added as a sensitization agent into this pigment slurry, and it poured into the face shield inside after black matrix formation, and the face shield was rotated, the excessive slurry was shaken off, and the uniform film of the resin constituent for filters of about 1.2 micrometers of thickness was formed. This thickness can be controlled by adjusting pigment slurry presentations, such as solid content concentration in process conditions, such as speed to shake off, or a pigment slurry, and poly vinyl alcohol concentration and polymerization degree. Next, by having used the shadow mask as the exposure mask, the mercury i line was irradiated, was developed into the pattern part in which a blue fluorescent substance is located, and the blue filter pattern was formed. When the blue filter pattern formed in this phase was inspected, the formation precision of a pattern is good and had sufficient filter shape.

[0042] After drying a filter pattern, the fluorescent substance constituent (what

distributed ZnSiAg as a blue fluorescent substance in PVA and an ammonium-dichromate water solution) which is degree process was applied, and the fluorescent substance pattern was produced like the above. The color cathode-ray tube was produced through sealing of CRT, and an exhaust air process.

[0043] The reflectance spectrum in the visible-ultraviolet area of CoO-aluminum 2O3 which is a pigment for blue filters typical to drawing 1 , and KCoPO4 used in the example is shown. It turns out that the direction of KCoPO4 which has a phosphoric-acid radical clearly has the high reflection factor (83.1%) in 365nm. Even when the difference was reproducing the absorption peak location of Co which is essentially transition metals of a certain thing with some spectrums with KCoPO4 filter and 2OCoO-aluminum3 filter and which pigment was used, it has checked that sufficient filter shape was obtained.

[0044] Using the same pigment slurry as the example 2. example 1, it poured into the face shield inside after black matrix formation, the face shield was rotated, the excessive slurry was shaken off, and the uniform film of the resin constituent for filters was formed. Next, the film of the same fluorescent substance constituent as an example 1 was formed on this, exposure and development were performed from the film side of the resin constituent for filters, and the blue filter pattern and the blue fluorescent substance pattern were

formed in coincidence. The fluorescent substance pattern whose precision improved was formed of the above, and the formation precision of a pattern was good like [a blue filter pattern] the example 1.

[0045] Next, the color cathode-ray tube was produced through sealing of CRT, and an exhaust air process like the example 1.

[0046] In the example 3. above-mentioned general formula (1), M=Li and the example which is the case of N=Co and which was used LiCoPO4 are explained. In addition, this pigment is **** about light color pink. The pigment slurry was produced by the same approach as an example 1. When the particle size distribution of LiCoPO4 in this slurry were measured by the same approach, it was 0.9 micrometers in mean particle diameter. Next, this slurry was poured into the face shield inside after black matrix formation, the face shield was rotated, the excessive slurry was shaken off, and the uniform film of the resin constituent for filters of about 2.0 micrometers of thickness was formed.

[0047] Next, by having used the shadow mask as the exposure mask, the mercury i line was irradiated, was developed into the pattern part in which a blue fluorescent substance and a red fluorescent substance are located, and the blue fluorescent substance pattern and the filter pattern which used LiCoPO4 pigment for the red fluorescent substance pattern location were formed. When this filter pattern was inspected, the formation precision of a pattern is good and

had sufficient filter shape. Next, like the example 1, the fluorescent substance pattern was formed and the color cathode-ray tube was produced.

[0048] In the example 4. above-mentioned general formula (1), the example using Co3(PO4) 2 which are the case of x= 1 is explained. In addition, this pigment is **** about dark purple. The pigment slurry was produced by the same approach as an example 1. When the particle size distribution of Co3(PO4) 2 in this were measured by the same approach, it was 0.6 micrometers in mean particle diameter. Next, this slurry was poured into the face shield inside after black matrix formation, the face shield was rotated, the excessive slurry was shaken off, and the uniform film of the resin constituent for filters of about 1.5 micrometers of thickness was formed.

[0049] Next, by having used the shadow mask as the exposure mask, the mercury i line was irradiated, was developed into the pattern part in which a red fluorescent substance is located, and the filter pattern which used Co3(PO4) 2 pigment for the red fluorescent substance pattern location was formed. When this filter pattern was inspected, the formation precision of a pattern is good and had sufficient filter shape. Next, like the example 1, the fluorescent substance pattern was formed and the color cathode-ray tube was produced.

[0050] Although the above-mentioned example gave the example about the case where N is mainly Co, in the above-mentioned general formula (1), the

same effectiveness is acquired also when other transition metals are used. Moreover, although AMORUFASU of an indeterminate form may be formed depending on a presentation since the above-mentioned presentation contains P which is a glass component, it is same in the absorption property over a mercury i line, and the same effectiveness is acquired. Moreover, although the example of the distributed solvent which uses water as a principal component as a pigment slurry presentation was shown, distributed solvents of a solvent system, such as a distributed solvent which uses ethanol as a principal component, are sufficient. Moreover, it cannot be overemphasized that other dispersants suitable for the pigment which it is not limited to the ingredient shown above also as a dispersant, but is used may be used. Moreover, as exposure ultraviolet rays, although it can be used besides a mercury i line, the same effectiveness is acquired by measuring and using the absorption (reflection) property in the ultraviolet-rays field of the pigment corresponding to the wavelength.

[0051] On the same conditions as an example 1, the filter and the color cathode-ray tube were produced except having used for the pigment for example of comparison 1. filters CoO-aluminum 2O3 which is a typical pigment for blue filters. When this filter pattern (stripe pattern) was inspected, the edge section lenticulated and the part into which the filter pattern has exfoliated was

also able to be seen. Since the mercury i line has been absorbed by blue pigment CoO-aluminum 2O3, the crosslinking reaction of the binder component in a pigment slurry does not fully advance, but this is considered to have been generated since adhesive strength declined.

[0052] On the same conditions as an example 4, the filter and the color cathode-ray tube were produced except having used for the pigment for example of comparison 2. filters Fe 2O3 which is a typical pigment for red filters. When this filter pattern (dot pattern) was inspected, much red filter exfoliations were accepted. As well as the example 1 of a comparison since the mercury i line has been absorbed by red pigments Fe 2O3, adhesive strength declines and this is considered that the deficit section arose.

[0053] Since ultraviolet rays will be absorbed by the resin constituent film for filters when it is going to form a filter pattern and a fluorescent substance pattern in coincidence like an example 2 using the pigment of the examples 1 and 2 of an example of comparison 3. comparison, sufficient adhesion force was not obtained and a filter pattern and a fluorescent substance pattern were not able to carry out pattern formation.

[0054]

[Effect of the Invention] The 1st pigment for filters of this invention is a pigment distributed by the sensitization liquid containing the induction component which

induces a resinous principle and ultraviolet rays and starts the polymerization of the above-mentioned resinous principle, and the reflection factor in the wavelength of the above-mentioned ultraviolet rays is 50% or more of thing, and it is effective in that there is little absorption of the above-mentioned ultraviolet rays.

[0055] In the pigment for filters of the above 1st, the wavelength of ultraviolet rays is 365nm and the 2nd pigment for filters concerning this invention is effective in that there is little absorption of 365 above-mentionednm ultraviolet rays.

[0056] The above 1st or the 2nd pigment for filters is [mean particle diameter] a thing 1 micrometer or less, and the 3rd pigment for filters concerning this invention is effective in transparency being acquired.

[0057] The 1st pattern-formation approach concerning this invention carries out ultraviolet-rays exposure, develops the film of the resin constituent for filters which comes to distribute the above 1st thru/or the 3rd one of the pigments for filters using an exposure mask in the sensitization liquid containing the induction component which induces a resinous principle and ultraviolet rays and starts the polymerization of the above-mentioned resinous principle, and is effective in a healthy filter pattern being obtained with high precision by the approach of forming a filter pattern.

[0058] The 2nd pattern formation approach concerning this invention is set to the pattern formation approach of the above 1st. Form in the film of the resin constituent for filters the film of the fluorescent substance constituent which comes to distribute a fluorescent substance in sensitization liquid, and ultraviolet rays are exposed and developed on it using an exposure mask from the film side of the resin constituent for filters. By the approach of forming a filter pattern and a fluorescent substance pattern in coincidence, formation of a healthy filter pattern and a fluorescent substance pattern can carry out to coincidence, and it is effective in contributing also to the improvement in the yield, or low cost-ization.

[0059] The 1st color cathode-ray tube concerning this invention is effective in coming to prepare a fluorescent substance pattern in a face shield inside through a filter pattern, and excelling in the display engine performance by the above 1st or the 2nd pattern formation approach.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is a reflectance spectrum Fig. in the visible-ultraviolet area which compares and shows the pigment for filters of the example of this invention, and

the conventional pigment.

[Drawing 2] It is the explanatory view showing the configuration of the phosphor screen of the conventional color cathode-ray tube.

[Drawing 3] It is the explanatory view showing the configuration of the phosphor screen of the conventional color cathode-ray tube.

[Description of Notations]

1 A face shield, 2 A black matrix, 3r A red fluorescent substance layer, 3g green fluorescent substance layer, 3b A blue fluorescent substance layer, 4r A red filter layer, 4g Green filter layer, 4b A blue filter layer, 5 Metal back.